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Technical Assessment of Selected Integrated Databases within DoD for the Deputy Director for Finance, Personnel, & Health Functional Information Management

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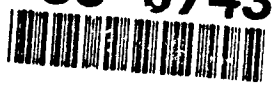

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This document describes the high-level review of the technical platforms of a selected set of DoD systems which utilize integrated databases to satisfy functional requirements. The purpose of the review was twofold: first, to assess the suitability of existing technical platforms to serve as foundation platforms for migration and, second, to recommend which, if any, of the reviewed databases and technical platforms could serve as a prototype for a DoD-wide integrated database. Seven DoD integrated databases were reviewed. Four commercial-off-the-shelf DBMSs were also evaluated for comparison purposes.

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Chapter 1

Introduction

1.1 Purpose

This document describes the high-level review of the technical platforms of a selected set of DoD systems which utilize integrated databases to satisfy functional requirements. The purpose of the review was twofold: first, to assess the suitability of existing technical platforms to serve as foundation platforms for migration and, second, to recommend which, if any, of the reviewed databases and technical platforms could serve as a prototype for a DoD-wide integrated database. Appendix A contains a copy of the Task Order Description: Acceleration of Cross-Functional Database Creation.

1.2 Scope

The scope of the review was limited to the following DoD integrated databases:

- Defense Civilian Personnel Data System (DCPDS)
- Personnel Data System (PDS)
- Stock Control System (SCS)
- Requirements Data Bank (RDB)
- DoD Resources Management System (DRMS) - (formerly APCAPS)
- Mechanization of Contract Administration Services (MOCAS)
- Marine Corps Total Force System (MCTFS)

Four Commercial off-the-shelf (COTS) DBMSs were also evaluated for comparison purposes:

- CINCOM Supra 2.0
- IBM DB2 V2R3
- NCR SharebaseIII
- Oracle 7.0

1.3 References

DoD Technical Reference Model for information Management. This document is available from the Defense Information Systems Agency, Center for Information Management. Contact Mr. John Keane, DISA-XI, (703) 285-5323.

DoD Technical Architecture Framework for Information Management. This document is available from the Defense Information Systems Agency, Center for Information Management. Contact Mr. John Keane, DISA-XI, (703) 285-5323.

Client/Server Guidelines. This document is available from DISA-XM, Technical Integration Services Directorate, Columbus, Ohio. Contact Mr. Gene McManus, (614) 692-5518.

User Interface Guidelines. This document is available from DISA-XM, Technical Integration Services Directorate, Columbus, Ohio. Contact Mr. Tom Magee, (614) 692-55122.

Finance Workstation Guidelines. This document is available from DISA-XM, Technical Integration Services Directorate, Columbus, Ohio. Contact Mr. Jeff Roth, (614) 692-5513.

DoD Human Computer Interface Style Guide. This document is available from the Defense Information System Agency, Center of Information Management. Contact Mr. John Keane, DISA-XI, (703) 285-5323.

Finance Near-Term Technical Architecture. This document is available from the Defense Information Systems Agency, Center for Information Management. Contact Mr. Dan Keary, DISA-XE, (703) 285-6580.

Finance Migration Strategy. This document is available from the Defense Information Systems Agency, Center for Information Management. Contact Mr. John Pelszynski DISA-XM, (703) 756-5518.

Finance Client/Server Implementation Guidelines. This document is available from DISA-XM, Technical Integration Services Directorate, Columbus, Ohio. Contact Mr. Gene McManus, (614) 692-5518.

Finance User Interface Style Guide (3270). This document is available from DISA-XM, Technical Integration Services Directorate, Columbus, Ohio. Contact Mr. Tom Magee, (614) 692-5512.

Finance Communications Implementation Guidance.

Chapter 2

Technical Assessment of Integrated Databases

2.1 Assessment Methodology

A technical attributes survey instrument was developed and employed to collect technical data about each existing database and its corresponding technical platform. In addition to addressing technical features of the hardware, software, DBMS and communications platform, the survey instrument also covered extent of DBMS conformance to the DoD Technical Reference Model (TRM), extensibility of the platform to handle DoD-wide workload, and availability of acquisition vehicles which could be used DoD-wide to acquire additional technical platform components to satisfy potential upgrades or expansion. A copy of the survey instrument is included within the Task Order Description in Appendix A.

Data was collected by OTI site survey teams already collecting data on Finance migration systems or by telephone or personal contact with technical specialists identified by the POCs for those systems not surveyed by the OTI teams. COTS DBMS information was contractor-compiled. An assumption of validity was made on the information provided by the POCs and their designees.

Technical characteristic information for each DoD system gleaned from the survey responses was assimilated and charted to a matrix titled "System Characteristics," to provide uniform portrayal to facilitate comparison with the other reviewed DoD systems and COTS DBMSs. The resultant populated characteristics matrices are contained in Appendix B.

COTS Relational Database Information was compiled about the most current version of four commercially available DBMSs, none of which is currently being used in any of the reviewed DoD systems. This information was charted to the COTS Database Information matrix contained in Appendix C. The information was compiled using various technical references and interviews with colleagues and vendors when necessary, to validate assumptions and clarify information. It was gathered for presentation at a high level for comparison purposes without consideration of viability of use or as an available acquisition vehicle. The four COTS DBMSs selected for comparison were NCR

Sharebase III; ORACLE Version 6.2; IBM DB2 V2R3 and CINCOM SUPRA Version 2.1. A discussion of each follows.

NCR Sharebase III was selected because it represents the dedicated, standalone database engine, suitable for medium size DBMS applications. The machine is currently installed at various sites within DoD: the Office of the Secretary of Defense, intelligence agencies, Air Force and Navy such as COMNAV-RESFOR (SEMA). The machine is a proprietary black box designed for performance where speed and query complexity are the main considerations. The machine strictly supports the ANSI/ISO SQL 2 standard. The dictionary is controlled by a system database that may be accessed with the proper permissions, by users or COTS, and non-COTS software. This allows interface to CASE tools, 4th Generation Languages, middleware, etc. The communication link is usually dedicated to a host (client) that serves as a front end terminal server. Client application software also resides on the host. Direct communication to several clients is possible. Installations using the machine are reliant on third-party software to provide access to the SQL parser and libraries if languages other than those directly supported by Sharebase are used. Distributed processing is also managed by the client. Security is nominal C2 but may be elevated to B2, again through the use of third-party software. The average number of concurrent users is estimated to be 128 based on minimum memory configuration and maximum data storage. The actual number of users supported is a function based on 75 percent of the amount of available memory. User capacity may be further controlled by modifying specific boot parameters, available channels and concurrent processes assigned to a user. Contention for client resources is minimized by off loading all the DBMS related activities to the Sharebase machine.

The remaining COTS DBMSs reviewed reside on a host machines where performance may be influenced by the environment. If the host supports general data processing as well as acting as host for the DMBS then contention for resources may be a factor. In general, the number of concurrent users of the DBMS is determined by the host system.

ORACLE supports a large number of platforms, being most popular on mid-range computers and PCs. ORACLE was one of the first SQL-based DBMSs. ORACLE is compliant with the SQL Standard (FIPS PUB 127-1) Ada Programming Language. ORACLE provides a suite of CASE, financial and other applications, and 4GLs, SQL*Forms and SQL*Plus. ORACLE does not currently provide ANSII/SQL 2 referential integrity nor a two phase commit. Communication is supported for CICS and three sets of protocol, Asynchronous and DECnet, Xodiac, 3270PC and SNA, non-SNA including LU6.2. Distributed processing is supported through ORACLE's SQL*Net and data access through SQL*Connect. Client/Server support is provided for Intel 80386 and 80486 technology. Certification for B2 security compliance was pending at the time this document was produced. ORACLE's main advantage is the portability of the product and applications generated using ORACLE's 4/GL. Enhancements to Version 6.2 include increased transaction and production throughput.

DB2 is IBM's offering for use in IBM's MVS environment. This DBMS is restricted to IBM; gateways to non-IBM platforms are not offered. The DBMS is not portable except to identically configured systems. IBM's SQL has been accepted as the defacto standard and is compliant with ANSII/SQL2 proposal's. DB2 uses a Catalog/Directory for managing database information. The catalog is the interface between DB2, CASE tools and other applications requiring database information. Communication is based on SNA LU6.2/APPC. Distributed processing is limited to applications that support IBM's Distributed Relational Database Architecture (DRDA), currently DB2 Subsystems, SQL/DS, Data Manager and Presentation Manager. A new precompiler feature allows DB2 to check SQL syntax for use on other SAA RDBMS systems. DB2 support for Remote-Unit-of-Work (RUOW) functions provides Client/Server support for the above DBMSs on VM, AS/400 and OS/2 systems. Security for DB2 complies with the underlying host MVS system and RACF.

CINCOM's SUPRA Version 2.1 is a full-functional RDBMS. SUPRA addresses the needs for high performance, large volume, online transaction processing over a number of platforms. SUPRA is based on a Three Schema Architecture that provides application and database independence. SUPRA provides comprehensive ANSII/ISO SQL support. Dictionary support is provided by the Global Directory, which also supports the distributed processing. CASE tools and non-procedural languages are available from CINCOM, and via SUPRA's open interface to third-party products. Communication support is provided for Ethernet, TCP/IP, Token-Ring LANs, LU6.2, as well as CICS connectivity. Security information was not available at the time this document was prepared.

Several additional matrices were developed to facilitate comparison and assessment of technical attributes, features, and capabilities. Responses to DoD-wide database survey questions were charted to a single matrix titled DoD-Wide Database Information contained in Appendix D. Appendix E contains a matrix of Acquisition Information compiled from the responses provided to survey questions.

Since conformance to the TRM is mandated for new development, a matrix (Appendix F) of pertinent partitions of the DoD Technical Reference Model was prepared. Appropriate information from the System Characteristics matrices, the DoD-Wide Database Information matrix, and the COTS Database Information matrices was mapped to the TRM matrix to provide a consolidated view and comparison of reviewed DoD platforms, and to better assess how much TRM compliance could be expected through comparison with TRM compliance of the four COTS DBMSs.

The TRM matrix was built using information from the System Characteristics matrices, the DoD-Wide Database Information Matrix, and the COTS Database Information matrices. TRM compliance was often not clearly addressed in the information supplied via the technical attributes survey, which was more directed to current requirements and support for the target systems. To the extent possible, an attempt was made to separate the technical aspects of the DBMS from the surrounding environmental aspects.

DBMS information for purposes of the TRM Summary is limited to information on the four commercial mainframe DBMSs which are central to mainstream core processing of reviewed systems:

- CINCOM's TIS, a network DBMS
- UNISYS' DMS 1100, an hierarchical DBMS
- Computer Associates' DATACOM/DB, a relational DBMS
- Software AG's ADABAS, an inverted list DBMS

The survey identified additional DBMSs (UNIFY 2000, UNIFY, IDS2) which are shown in the matrix for documentation purposes only.

Information from recognized industry sources and from vendor-supplied documentation was used to supplement information from survey responses about the four mainframe DBMSs. DBMSs were viewed as independent from their current environment and without knowledge of other influence, e.g., degree of data normalization and query complexity, contention for resources, and portability based on independence of data (logical versus physical) from the DBMS or the application. Isolating the DBMS from the environment and other influences was necessary when reviewing the DBMS on its technical merits. The matrix does not attempt to depict performance of the DBMS. Environmental factors such as number of indices, incorrect data normalization, and resource contention can affect performance. It is assumed that existing systems have been tuned to maximize performance efficiency.

Areas depicted in the Compliance with TRM Summary matrix directly related to the database engine are:

- Data Management, which encompasses Directory/Dictionary, DBMS (engine), Remote Data Access
- Programming, encompassing SQL, Ada, CASE Tools
- DBMS-controlled Security

Areas considered under the control/influence of the environment are:

- User Interface (limited to client/server)
- Network (limited to Data Communication)
- Security control related to the processing platform or an application

The Directory/Dictionary column on the matrix shows all the DBMSs in partial compliance with the TRM either through incorporation of a Directory/Dictionary as part of the DBMS or through a layered product interfacing with the DBMS. The IRDS guidelines are not complete so at this time no product is in total compliance. DBMS compliance to the TRM model was based on the information supplied in the survey.

Remote Data Access between a single client and server was treated, with respect to the support for this activity, without regard for the current implementation of such remote access. Survey items

indicating that remote access is being addressed by the environment outside the control of the DBMS are shown on the matrix. Data consistency was not an issue considered, the assumption being that Level I consistency was the norm. That is, the data would be remotely read—locally written, or the data read was a copy or clone of the remote data, and consequently might not necessarily reflect the actual status of the data at the instant the application processed the remote data.

Programming language support for SQL and Ada gathered from the survey was difficult to ascertain. In general, all users indicated that they would support Ada in the future in compliance with the TRM. Although support for Ada indirectly implies SQL support, this relationship was not reflected in the survey. The migration to a relational environment predisposes the use of the defacto standard, SQL. However, there may have been some confusion related to SQL, since it was referenced in the survey three ways: first, implied by the DBMS adherence to the TRM; second, as a programming language; and third, in the context as a TRM standard. CASE tools were depicted as to availability only. Information on the degree of integration, whether bundled with the DBMS or acquired as an add-on or layered product, was not readily available from the survey in most cases.

User Interface information was restricted to current client/server activities directly related to DBMS access. This was treated as an environmental issue due to the nature of the responses to the survey. Similarly, Network Services/Data Communication was also treated as an environmental issue.

Security as applied to the DBMS was taken from the survey responses. There was no attempt to correlate responses to the security compliance of the DBMS as stipulated by the vendor. All other security issues related to platform or application were considered environmental issues and charted as such.

A set of characteristic factors was established, against which each reviewed system could be methodically examined, using the information contained in the populated matrices. These factors included:

(1) Use of Commercial DBMS - A commercial DBMS foundation should provide a better and easier migration path towards an open systems environment than custom-developed data management software.

(2) Relational DBMS - A relational DBMS (RDBMS) provides a data management services framework which is more suitable for data sharing and which will facilitate the interchange or substitution of like-function products or technologies which may become available through new contracts. For example, an existing RDBMS might be replaced by a database machine or some other RDBMS on a different platform without requiring significant modification of application programs. Candidate systems already using an RDBMS, or that can be readily upgraded to use one in a timeframe acceptable to accelerated database implementation targets, will be better positioned to take advantage of opportunities to incorporate new technologies and to participate as servers in heterogeneous database environments.

(3) SQL - Structured Query Language (SQL) is the standard language for providing DBMS services for definition, management and query of structured data within a relational database management system. Emerging Remote Data Access standards also rely upon SQL statements to specify data access requirements.

(4) Contract Scope - Existence of contract vehicles to acquire additional hardware/software to satisfy DoD-Wide expansion was considered crucial, i.e., acquisition vehicles are needed which are not limited in scope to acquiring platform components only within the service or agency of contract origin.

(5) Ada - Availability of Ada is considered to be an important characteristic since DoD policy mandates Ada use for DoD systems development. Embedded SQL or implementation of the SQL Ada Module Extensions (SAME) would be an added benefit.

(6) Additional TRM Compliance - The degree of compliance with additional TRM factors was examined in comparison with the degree of compliance of representative COTS DBMSs. No single additional TRM factor was considered critical, but TRM factors which are met by available COTS products are considered more important than those for which no COTS compliance exists or those for which there are yet no standards against which to measure compliance. A vendor's commitment to industry standards was also considered important. Thus, a vendor committed to GOSIP and POSIX, for example, would be considered more favorably than one not so committed.

The assessments which follow below include a business overview for each system, a description of its technical platform, and a determination of the extent to which the platform characteristics correspond to the characteristic factors described above.

2.2 Technical Assessments

2.2.1 Defense Civilian Personnel Data System (DCPDS)

2.2.1.1 DCPDS Business Overview

DCPDS is a Corporate Information Management (CIM) migration system. The Assistant Secretary of Defense Command, Control, Communications and Intelligence designated the Air Force Personnel Data System Civilian (PDS-C) as the interim standard Defense Civilian Personnel Data System (DCPDS). PDS-C is the civilian personnel module of the Personnel Data System, an integrated system that also supports active duty Air Force Military Personnel, Air and Army National Guard and Reserve components.

DCPDS is a personnel information system which provides automated support for the primary functions of human resources management for approximately 90 percent of the total DoD civilian population.

DCPDS provides real-time access to civilian personnel data; documents personnel actions; and establishes and maintains historical data for planning, analysis, reporting, and forecasting. The system is fully operational. The three services (Army, Air Force and Navy) are the primary DoD users. Other DoD major organizations/activities supported by DCPDS are Defense Mapping Agency (DMA); the Uniformed Services University of the Health Services (USUHS); Office, Secretary of Defense (OSD); DoD Inspector General (DoDIG); National Guard Bureau; and DoD Dependent Schools (DoDDS).

Each of the three services uses the Air Force developed system with a tailored set of logical tables that implement each service's requirements beyond core functionality.

Personnel Data System-Civilian (PDS-C) is the base level, real-time personnel system for the Air Force. It supports all Air Force civilian and DoDDS personnel. Data entry and data query are done by the Civilian Personnel Office in an on-line environment. Editing is done in accordance with personnel action processing policy. Updating occurs during data entry. At the completion of the daily interactive period, the End-of-Day (EOD) routines are executed to process suspense actions, process ad hoc workforce-level requests, create interfaces to the Headquarters Air Force (HAF) and payroll systems, and perform housekeeping tasks. In addition to the functional requirements established by non-DoD oversight agencies, PDS-C supports various agency-level functions and processes, and incorporates many value-added sub-applications in such areas as Career Management and Training.

Army Civilian Personnel System (ACPERS) is the base level, real-time personnel system for the Army. It supports all Army civilian and DoDDS personnel. Data entry and data query are done by the Civilian Personnel Office in an on-line environment. Editing is done in accordance with personnel action processing policy. Updating occurs during data entry. At the completion of the daily interactive period, the End-of-Day (EOD) routines are executed to process suspense actions, process ad hoc workforce-level requests, create interfaces to the Headquarters ACPERS and payroll systems, and perform housekeeping tasks. In addition to the functional requirements established by non-DoD oversight agencies, ACPERS supports various agency-level functions and processes, and incorporates many value-added sub-applications in such areas as Career Management and Training.

Naval Civilian Personnel Data System (NCPDS) is the base level, real-time personnel system for the Navy. It supports all Navy civilian personnel. Data entry and data query are done by the Civilian Personnel Office in an on-line environment. Editing is done in accordance with personnel action processing policy. Updating occurs during data entry. At the completion of the daily interactive period, the End-of-Day (EOD) oversight agencies, NCPDS supports various agency-level functions and processes.

2.2.1.2 DCPDS Technical Platform Description

The current DCPDS technical platform varies, depending upon which version of the system is examined. The Air Force version (PDS-C) runs on Unisys 1100/2200 mainframe computers which reside at Air Force bases world-wide. The Unisys-provided operating system is OS 1100. The Army

version (ACPERS) also runs on Unisys 1100/2200 mainframe computers located at the computer services center services center in San Antonio, Texas, while the Navy version (NCPDS) runs on Burroughs mainframe computers (B4925, B3955, B2930) located at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. However, the Navy is in the process of migrating its version to the Unisys 1100/2200 hardware platform. This migration is targeted for December 1993. The Air Force provides both the Army and the Navy with software support maintenance based upon Inter-Service Support Agreements. The core system developed by the Air Force and used in both the Air Force and Army versions uses DMS 1100, a CODASYL hierarchical/network DBMS from Unisys Corporation, but until the Navy conversion to Unisys, the Navy version uses indexed files. The Air Force developed core system uses a different table-set designed to support the particular requirements of that services version. The three versions also have somewhat different communications environments. Users access the Air Force system through Unisys-compatible terminals and Personal Computers. Transactions which flow to the corporate level database use AUTODIN. Input to the Army Field ACPERS is accomplished by each Civilian Personnel and EEO office via micro-computers or via W/B26 terminals and personal computers using the Unisys 5000/70 minicomputer as a concentrator connected via a communications network to the mainframe computer. Transactions flow from ACPERS to the corporate level database via a dedicated 56KB line using SNA Net on a DCP-30. NCPDS uses a DCP-40 front end to send data over the communications network. In addition to the core system, the Air Force has developed a minicomputer-based system which employs a commercial DBMS to provide supplemental capabilities beyond the civilian personnel office. The Personnel Concept-III system uses data downloaded from the mainframe to a minicomputer for online query by managers. It also provides a standardized office automation package. This system is implemented on AT&T 3B2/600G minicomputers using the UNIX operating system and the UNIFY relational database management system.

2.2.1.3 DCPDS Technical Assessment

The core DCPDS system does not employ a Relational Database Management System, nor are there any near-term plans to replace the current DBMS with an RDBMS. Although the Air Force and ARMY versions use the Unisys DMS 1100 DBMS, the NAVY version does not. Several candidate COTS RDBMSs are being considered for their potential for future transition.

SQL capability does not exist for the core system. Provision of SQL capability will require replacement of the current DBMS with a relational DBMS.

Existing contracts could be used to acquire additional hardware and software for expansion of the current core system platform and the current platform for the PC-III system. It is not known if existing contracts for core system platform components could be used to replace the current DBMS with a relational DBMS, nor is it known if the scope of existing contracts permits further acquisitions for use outside the Air Force. There are no existing contracts to obtain additional hardware and/or software to expand the current headquarters level systems.

Ada is neither currently supported nor used for development of core system database applications.

Survey responses disclosed that the core system has very little compliance to the DoD Technical Reference Model while the more recently developed PC-III system has a high level of compliance since it utilizes a relational DBMS, SQL, and operates in a UNIX environment.

2.2.2 Personnel Data System (PDS)

2.2.2.1 PDS Business Overview

The Personnel Data System (PDS) is the Air Force's integrated Total Force Personnel System. The central PDS database, Headquarters Air Force (HAF), maintained at the Air Force Military Personnel Center (AFMPC), and base level databases maintained at air bases worldwide, contain Active Duty Military, Civilian, National Guard, Air Force Reserve, Retired Military, and Foreign National records. The concept of storing active duty and reserve personnel records on the same computer system (both headquarters and base level) facilitated activating the reserves during Operation Desert Storm and deactivating them at its conclusion. The PDS provides personnel mission support at all organizational levels within the Air Force. Most civilian personnel transactions originate in the Personnel Data System—Civilian (PDS-C) on the Base Level Personnel System (BLPS) and flow to the HAF database. Most military transactions originate at the HAF level and flow to the Base Level Military Personnel System (BLMPS). Each month approximately 15.6 million Master File transactions and 145,000 PC III on-line transactions are processed to keep the central database current. In addition, the PDS supports about 32,000 ad hoc inquiries and processes 73,000 documents to microfiche each month. The PDS provides complete personnel support separation. Retiree records are maintained to support voluntary recall/mobilization activity. A historical file of all active duty and retiree deaths is also maintained. The major functions include recruiting support, training pipeline management, readiness and mobilization, officer and airman assignments, promotion board support for active and reserve personnel, performance appraisal administration, retirement processing, and administration of mandatory separation programs dictated by Congress.

2.2.2.2 PDS Technical Platform Description

PDS is supported by technical platforms at four levels: Headquarters Air Force level, Major Command level, Base level, and Unit level. Each level interoperates with standard data structures using hardware, software, and databases that are structured to that level's functional and organizational requirements and environment. The technical platforms supporting the headquarters and Major Command levels consist of DPS8000 Honeywell systems and AT&T 3B2 computers supporting different size users populations. The Database and Transaction Processing Systems are DM-IV and TP-8, Honeywell's versions of IDS-II Database and Transaction Processing systems. Operating systems are GCOS 8 on the Honeywell systems and UNIX on the 3B2 systems. For civilians, databases at the Headquarters and Command levels aggregate data from the base level systems primarily for statistical reporting and planning purposes. For military personnel, most transactions originate in the headquarters database and flow to the base level for confirmation. Transactions

generated at the base level are transmitted via AUTODIN at the end of each work day to update the central database.

The Base Level Personnel System (BLPS) consists of the Base Level Military Personnel System (BLMPS) and its civilian personnel counterpart (PDS-C). BLMPS and PDS-C share the same technical platform as described for the Air Force developed PDS-C version of DCPDS (see 2.2.1 description). Both BLMPS and PDS-C run on Unisys 1100/2200 mainframe computers which reside at Air Force bases world-wide. Both BLMPS and PDS-C use DMS 1100, a CODASYL hierarchical/network DBMS and the OS 1100 operating system provided by Unisys. Users access base level PDS through Unisys-compatible terminals and Z-248 Personal Computers. Transactions which flow between the base level database and the HAF level database use AUTODIN.

In addition to the core system, the Air Force has developed a minicomputer-based system which employs a commercial DBMS to extend the automated personnel functions to the unit level. The Personnel Concept-III system uses a subset database from the mainframe on a minicomputer to support online query, online update and forms generation and processing by managers and unit level technicians. It also provides a standardized office automation package. This system is implemented on AT&T 3B2/600G and 3B2/600GR minicomputers using the UNIX operating system and the UNIFY relational database management system.

2.2.2.3 PDS Technical Assessment

The core PDS system (BLPS) does not employ a Relational Database Management System, nor are there any near-term plans to replace the current DBMS with an RDBMS. However, although several candidate COTS RDBMSs are being considered for their potential for future transition.

SQL capability does not exist for the core system. Provision of SQL capability will require replacement of the current DBMS with a relational DBMS.

Existing contracts could be used to acquire additional hardware and software for expansion of the current core system platform and the current platform for the PC-III system. It is not known if existing contracts for core system platform components could be used to replace the current DBMS with a relational DBMS, nor is it known if the scope of existing contracts permits further acquisitions for use outside the Air Force. There are no existing contracts to obtain additional hardware and/or software to expand the current headquarters level systems.

Ada is neither currently supported nor used for development of core system database applications.

Survey responses disclosed that the core system has very little compliance to the DoD Technical Reference Model, whereas the more recently developed PC-III system has a high level of compliance since it utilizes a relational DBMS, SQL, and operates in a UNIX environment.

2.2.3 Stock Control System (SCS)

2.2.3.1 Business Overview of SCS

The SCS encompasses three major functional components: requisition processing and distribution management, returns management, and disposal management. The requisition processing and distribution management component provides support for wholesale material management. It is based on the consolidation of the Air Force Stock Control and Distribution System (SC&D) and the Army's Requisition Validation (REQVAL) system, Equipment Release Priority System (ERPS) and Major Item Requisition Validation (MIRV) system. The consolidated system supports the following business functions: the item manager wholesale requisition process, wholesale management and efficiency reports, wholesale and retail receiving and shipping, inventory and storage process, requisition validation, equipment release prioritization, and major item requisition validation. It enables the Inventory Control Point and Storage Activities to share/update information in a real-time, single asset record environment. The returns management component consolidates the Air Force Recoverable Assembly Management Process (RAMP), the Navy Carcass Tracking, the Navy Master Repairable Item List (MRIL), and the Army Material Returns Program (MRP). This system provides visibility and tracking of repairable assets down to the customer (user) level. The disposal management component combines the Army Disposal Material On-line Requisition System (DMORS) and the DMORS' Disposal Maintenance Batch System (DMBUCS) with the Navy Uniform Inventory Control Disposal System. The consolidated system facilitates detection of inactive or non-essential items, contributing to the reduction of DoD inventories.

2.2.3.2 SCS Technical Platform Description

The hardware platform for SCS consists of large-scale IBM compatible mainframes. The software platform comprises a wide range of IBM and other COTS products which run in the IBM MVS/ESA environment, including the DBMS, Datacom/DB, a commercial DBMS from Computer Associates, International, Inc. SCS currently runs at five sites; development and testing is conducted at a sixth site. SCS is also a designated migration system and will expand its scope of operations to serve DLA and other services. The expansion is expected to result in deployment of eleven additional physical databases on essentially the same or a compatible upgraded platform.

2.2.3.3 SCS Technical Assessment

SCS is supported by Datacom/DB, a modern commercial relational database management system. Although the latest version of the DBMS is not currently being used, migration to the latest release is planned to take place within the next year.

The software platform complies, at least in part, with key aspects of the DoD Technical Reference Model although some of the capabilities are not currently being used by SCS.

ANSI and FIPS SQL are supported by the DBMS, but SQL is not currently being used within SCS. However, it is anticipated that SQL will be used in the future.

A variety of contracts either currently exist, or are in progress, to obtain not only additional copies of the DBMS, but also additional hardware, operating system software and other COTS products for expansion of the technical platform. SCS representatives believe that current contracts could be used to obtain products for use outside their component, but are not certain what effect DMR918 or other DMRDs will have on existing contracts or future acquisitions.

The Ada programming language is supported, but is not currently being used. Future use of Ada is planned, pending necessary funding availability.

The communications environment for SCS is currently IBM SNA. DISN will provide the future communications environment for extension to other platforms.

The DBMS incorporates an active dictionary/directory which is used by SCS. Representatives did not know to what degree the dictionary might be consistent with emerging IRDS standards. The DBMS also allows interface of CASE tools to the database. SCS uses a commercial CASE product called CADRE. Data definitions from CADRE are fed into the active data dictionary via the interface.

While not currently being used by SCS, a new CA product called CA-DB:STAR is currently being tested by the government. This product provides data distribution services to multiple Datacom systems, providing the ability for applications to transparently access and update distributed data as if it were managed by a single DBMS. One potential use for this product would allow the incremental expansion of databases by building additional physical databases on separate hardware platforms which become extensions to the single logical database, i.e., the existence and location of multiple physical databases is transparent to applications and MIS tools which access the logical database. This distributed operations product would also make it possible for a single process to access multiple Datacom/DB databases built independently at different locations, even when the databases have different structures and content.

DBMS security is currently embedded within the DBMS, but a future release will eliminate the embedded security code through provision of an interface to the COTS security product TOP SECRET.

According to vendor representatives, the vendor is committed to supporting industry standards and is actively moving in the direction of POSIX. The vendor's products operate on various platforms other than IBM-compatible, including mini and microcomputer platforms.

2.2.4 Requirements Data Bank (RDB)

2.2.4.1 RDB Business Overview

The RDB, currently under development in the Air Force, is a total system for supporting requirements needs for all items. The system consists of a relational database and modular programs which run independently of the database. Application modules determine initial and replenishment requirements for all categories of items including aircraft engines. The system computes repair requirements for all Air Force items, groups items into families, calculates program values to the item level, and provides item managers on-line review of forecasts and buy/repair recommendations. The system sets controls and support levels to control all inventory actions. The system contains an applications and indenture file for all items, relating them to their weapon system for total weapon system requirements. The RDB system concept requires that all levels of management share accurate and timely logistics information for strategic planning, forecasting, management direction and control and operational control of logistics resources, specifically regarding the inventory levels needed to support readiness capabilities. As data is processed in the RDB, it is updated and made immediately available for use by various functional groups at different locations. The system concept provides functional support to the requirements processes by furnishing computational capabilities and detailed information retrieval. The primary information deals with demands, pipelines, inventories and usage and activity rates. Outputs of the system appear as buy quantities and repair requirements. In addition, budgets to justify the dollars needed to logistically support operations are provided to managers. The RDB system also provides the capability to compute requirements to achieve weapon system availability objectives as well as record item demands/usage by weapon system.

2.2.4.2 RDB Technical Platform Description

The hardware and software platforms for RDB are both essentially the same as the platforms for SCS, i.e., large-scale IBM mainframe, Datacom/DB DBMS and a wide range of ancillary COTS products. CASE tools used for RDB are different from those used for SCS. RDB uses a tool called Design/Recovery, which feeds to another tool called Excelerator. The RDB CASE tools are not interfaced to feed the dictionary, but Excelerator feeds the Ventura Desktop Publishing product to publish documentation.

2.2.4.3 RDB Technical Assessment

Since the technical platform for RDB is essentially the same as the technical platform for SCS, the RDB technical assessment is equivalent with one significant difference: contracts currently in place for RDB cannot be used to obtain additional products for expanded use outside of the component. However, RDB representatives stated their belief that DMR 924 initiatives may provide the acquisition scope sufficient to provide for DoD-Wide use. In addition, since the platforms are so much alike, it might be possible to use SCS acquisition vehicles to supply additional technical platforms for RDB.

2.2.5 Defense Business Management System (DBMS)

2.2.5.1 Business Overview of DBMS

Defense Business Management System is an integrated system which supports management of cross-functional areas which utilize common data. This system consists of four distinct subsystems:

(1) Personnel
(2) Payroll
(3) Cost
(4) Appropriation Accounting

Data is input into the systems via a single standard on-line interface, and validation criteria for all subsystems is applied at that time. The data is captured in an integrated database, which is utilized by all of the various subsystems. Thus data is entered and validated once for use by all subsystems, providing consistency and reducing personnel support requirements.

Defense Business Management System has been designated the migration system for DBOF/Resource Administration by OSD-C.

2.2.5.2 Defense Business Management System Technical Platform Description

The hardware platform for Defense Business Management System consists of medium and large scale IBM 370/390 architecture compatible mainframes. The current software platform required for Defense Business Management System processing is IBM's MVS/XA or MVS/ESA operating system; the commercial DBMS used by Defense Business Management System is Cincom's Total Information System (TIS) and associated products. Other IBM and third party vendor COTS products are also used to complete a manageable run-time environment. DITSO-CO has been leading an effort to consolidate Defense Business Management System at two sites, IPC Columbus and Dayton. Defense Business Management Syste currently runs on seven computers at the two sites. An acquisition is underway for larger mainframes to reduce the number of required machines.

2.2.5.3 Defense Business Management System Technical Assessment

Defense Business Management System currently utilizes a network-based commercial database management system, Cincom's TIS. However, Defense Business Management System is being aggressively migrated to SUPRA, Cincom's relational DBMS. Developmental transition to SUPRA is complete. The IOC began 11 November 1992, with an estimated completion date of January 1993. Conversion of all production systems is scheduled for completion by April 1993. Subsequently,

Defense Business Management System plans to migrate to the vendor's latest version, SUPRA 2, which incorporates SQL support.

The current DBMS (TIS) does not support SQL. SUPRA 2 provides support for ANSI and FIPS SQL.

Contract DCA200-92-D-0053, awarded 3 September 1992, allows all DISA components access to the SUPRA 2 suite of software. The contract also contains provisions for technology refreshment. It is anticipated that the dollar amount of the contract will be enlarged to permit standardization by DISA AISs on the SUPRA product.

The Ada programming language is supported by the MVS/XA/ESA - SUPRA 2 environment, but is not being utilized. Embedded SQL support for Ada is not currently supported, but the vendor states it will be available within a year. Development using Ada would require an Ada compiler for the environment to be acquired for the CDA, and run-time libraries for operational DPIs.

The current Cincom DBMS utilizes its own native transaction processing system, Communications Monitor (CM). Upgrading to SUPRA 2 requires that IBM's Customer Information Control System (CICS) be acquired and integrated into the current platform. VTAM/SNA is an integral part of the MVS/XA/ESA operating system environment. IBM's and Interlink's TCP/IP products are utilized to supplement processes/communication with smaller non-IBM tier systems.

The Cincom DBMS uses its own proprietary Dictionary/Directory. Interfaces to other COTS dictionary products/CASE tools may be available, but current Defense Business Management System CASE tools are not interfaced to feed the
DBMS.

The Defense Business Management System development platform contains a variety of CASE tools including KnowledgeWare, PM/SS, Case2000, Inspector, Recoder and Advantage.

SUPRA products are available in the UNIX/Open Systems environment providing potential for migration from a proprietary environment to an Open Systems environment.

2.2.6 Mechanization of Contract Administration Services (MOCAS)

2.2.6.1 MOCAS Business Overview

MOCAS is an integrated system which supports the Contract Management functions performed by the Defense Contract Management Command (DCMC) and the contract payment functions performed by the Defense Finance and Accounting Service (DFAS). MOCAS has been designated as a Finance migration system for Contract Payment and was recently nominated by the CIM Procurement Council as the migration system for the Contract Administration functional areas administered by the Defense

Contract Management Command (DCMC). The MOCAS system consists of nine distinct subsystem structures. They are listed as follows:

(1) Contract Maintenance for establishing and maintaining contracts within the MOCAS system. Contracts enter the system either via online interactive processes or via MILSCAP transactions. Limited data may be obtained via online inquiries and large amounts of information may be obtained via delayed inquiries which provide 24 hour turnaround.

(2) Materiel Control which tracks and records contractor performance in supplying goods and/or services under contracts maintained within the system.

(3) Financial Management which provides the source of funds and the accounts used to control the obligation and payment of a contract entered into the MOCAS system.

(4) Contract Management which provides direct support of contract management functions including Contract Administration, Property Administration, and Transportation.

(5) Quality Management which provides tools for the DCMC Quality Assurance Community to track the status of deficiency reports, provide data for analytical and executive information systems, monitor quality assurance efforts and provide Quality Assurance Specialists with additional training and expertise required to perform their duties.

(6) Programming and Technical Support which provides tracking of contractor delivery performance, industrial relations data, industrial preparedness planning, and pre-award survey reporting.

(7) Management Information which provides a series of statistics extracted from each DCMD database that are transmitted electronically for aggregation at DCMC.

(8) System Support which provides data and control support for all portions of the MOCAS system, including activity address maintenance for maintaining contractor and government address information, an online interactive capability to maintain attribute data for contracting officers and other personnel, as well as a variety of other applications for MOCAS system table maintenance.

(9) Operations Support which provides global support for the MOCAS operations environment including utility programs for maintenance of database files, special-purpose extracts, and download extracts. Also included is a database interface through which all applications request data in a batch environment. A contract transfer process provides for controlled organizational realignment of contracts across existing MOCAS databases.

2.2.6.2 MOCAS Technical Platform Description

The current core MOCAS system technical platform is essentially the same as the current Defense Business Management System technical platform since both MOCAS and Defense Business Management System shared a common DLA-provided and supported technical platform (see 2.2.5.2 and Appendix B, System Characteristics Charts for MOCAS and Defense Business Management System). The current MOCAS system runs on IBM-compatible mainframe hardware using Cincom's Network-based Total Information System (TIS) DBMS and a variety of IBM and third party vendor COTS products running under the MVS operating system. The development environment for MOCAS includes a different principal CASE tool from Defense Business Management System in Texas Instrument's Information Engineering Facility (IEF). However, IEF has had limited use to date since it is a very recent addition to the MOCAS CASE software suite.

2.2.6.3 MOCAS Technical Assessment

Since the technical platform for MOCAS is essentially equivalent to the current Defense Business Management System platform, the technical assessment is also essentially the same. However, MOCAS is not currently moving as aggressively as Defense Business Management System to migrate to SUPRA, Cincom's relational DBMS. Current plans are to migrate to SUPRA 1 around 1st quarter of FY94; apparently there are no firm plans yet in place for subsequent migration to SUPRA 2.

Although responses to the survey indicated that contractual vehicles are available to purchase additional copies of the DBMS, operating system and other system software and hardware, there is some uncertainty whether existing contracts are sufficient to acquire all the products needed to migrate to SUPRA 2 or if the contract scope would allow use outside of DLA. If, however, SUPRA 2 is considered to be an upgrade to the current Cincom software suite, then it is possible that some excess licenses resulting from ongoing consolidations could be used for other purposes. If MOCAS CDA resources become part of DISA, then the DISA contract for the SUPRA 2 software suite could presumably be used to acquire the products needed for migration.

2.2.7 Marine Corps Total Force System (MCTFS)

2.2.7.1 Business Overview of MCTFS

The Marine Corps Total Force System (MCTFS) is jointly supported by the HQMC, Manpower Information Division and the Defense Finance and Accounting Service, Kansas City. MCTFS, scheduled for completion in October 1994, is a consolidated pay and personnel system for both the Active, Reserve and Retired components of the Marine Corps. MCTFS became a distinct project under the Defense Joint Military Pay System (DJMS) in October 1991. MCTFS will merge the functionality and data structures of the Reserve Manpower Management and Pay System (REMMPS) and the Joint Uniform military Pay System/Manpower Management System (JUMPS/MMS) into a

single consolidated pay and personnel system. The existing active pay and personnel system, JUMPS/MMS, was chosen to serve as the baseline for MCTFS development. JUMPS/MMS software will be modified to accommodate reserve functionality and standardize the transaction codes for active, reserve and retired functions.

All Marine Corps pay and personnel transactions are processed centrally at the DITSO, Kansas City Information Processing Center (IPC). There are approximately 80,000 - 90,000 transactions sent to Kansas City daily over the Marine Corps Data Network (MCDN) utilizing long-haul communications lines, dial-up lines, satellite links and other forms of telecommunications. Data is collected at field activities by either the Unit Diary System (UDS) or the On-Line Diary System (OLD). These two systems edit the field input and batch up all transactions for nightly updating of the central Kansas City database. Update and edit error reports are sent back to each unit that submitted transactions. An extract of the central database containing each unit's personnel and pay information is made available to individual unit commanders for local query and report generation.

2.2.7.2 MCTFS Technical Platform Description

The hardware platform for the MCTFS located in Kansas City consists of large scale IBM mainframes. The software platform consists of a wide range of IBM and commercial COTS products running under an MVS/XA operating system. The platform includes the CICS teleprocessing monitor. ADABAS, an inverted list DBMS from Software AG, is used as the database management system. Much of the application software is written in ALC, COBOL II and ADAMINTS, a proprietary Software AG programming language. The central database used for update processing consists of VSAM file structures. Data is offloaded nightly from the VSAM files and placed into ADABAS structures designed to satisfy database query and reporting requirements. Field data collection and query applications are run on DOS compatible personal computers, some of which are connected to LANs at larger sites. Distributed databases are refreshed nightly primarily on the basis of a "touched record" concept, i.e., those records which are updated during the nightly batch update process are sent back to field locations from the central location maintain currency. However, since not all updates to the central database are the result of transactions fed upward from the unit level, a portion of the entire database is also sent nightly so that field level databases are completely refreshed over a period of days.

2.2.7.3 MCTFS Technical Assessment

MCTFS does not currently use a commercial relational database management system for its mainstream processing. ADABAS version 5.18, an inverted list DBMS, is used to host data offloaded from the VSAM files to provide query and reporting capabilities to users without impacting production processing. However, the MCTFS POC indicated that the application software is loosely coupled to the database in that interfaces to the DBMS/file structures have generally been isolated to common modules. This design policy should make replacement of the data management engine easier to accomplish than if the access code were embedded throughout all application software.

SQL is not applicable to either the mainstream processing utilizing VSAM files nor to the hierarchical ADABAS DBMS and consequently is not used. SQL capability is dependent upon implementation of a relational DBMS.

Acquisition vehicles do not exist to acquire additional/new DBMS software or additional copies of teleprocessing monitors, operating systems or other software which would be needed to extend the technical platform.

All PC applications for front-end aggregation of transactions at the Unit level are developed in Ada. Ada is not currently being used for mainframe development. However, a pilot mainframe Ada project has recently been completed, and plans are in place to re-engineer a sizable (approximately 100K lines) application in Ada in the very near
future.

Commercial CASE tools are not currently used; however, procurement action is in progress to support a CASE environment for Ada applications.

The current technical platform has limited compliance with the DoD Technical Reference Model.

Chapter 3

Prototype Candidates from Database Assessments

3.1 Prototype Recommendation Methodology

The databases platforms which were assessed for their technical capability in Section 2 of this document were further considered for their ability to serve as a prototype for a DoD-wide workload.

3.1.1 Criteria

Each of the candidates was considered for its applicability to the Platform-Only and Platform-and-Content Approaches outlined below. Relevance to the Software Interface Approach was also considered.

The Prototype question matrix (Appendix G), built through analysis of questionnaire responses and direct input from POCs, was used in considering whether a candidate would be an acceptable prototype.

The critical elements were: the extensibility of the platform to serve a DoD-wide role and the available acquisition vehicles and technical expertise to accomplish that extension. In evaluating for replication and expansion of an existing database, the extent to which the database already performed an integrated role was also considered.

A prototype should also adhere to the following precepts:

- The initial prototype should be implementable in the near-term and will be inquiry-only. It will have a well-defined, narrow scope, with a capability for incremental expansion when proven. This will provide the lowest risk opportunity to apply integration technology with minimal disruption of the critical ongoing production environment.

- The target DBMS structure is relational and SQL compatible in a client/server configuration. Any prototype should show movement toward that target.

- Implementation of a database will comply with the migration strategy and any other associated guidelines for the targeted community. For the Finance community, the following documents apply:

  - Finance Migration Strategy
  - Finance Technical Architecture
  - Finance User Interface Style Guide
  - Finance Client/Server Guidelines
  - Finance Communications Guidelines
  - Finance Workstation Guidelines

- Any prototype will be driven by requirements of the functional community, and not be an exercise in technical proficiency. Data models for the database will be provided by the functional community.

- Reuse should be maximized. That is, wherever possible, the current investment in platforms, databases, supporting tools, and technical expertise should be capitalized, rather than pursuing a new start

3.1.2 Caveats

The POCs for all the evaluated databases, except MCTFS, indicated the availability of contractual vehicles to support expansion to a DoD-wide database platform. However, the extensibility of both the RDB and SCS Datacom-DB contracts appears to be dependent upon yet to be awarded DMRD 924 contracts. It is also unknown how consolidations under DMRD 918 will impact contract vehicles in place. Defense Business Management System appears to have the soundest footing contractually, since their acquisition vehicle is designated for DISA.

The availability of technical expertise could also be impacted by DMRD initiatives, both where the expertise rests in the contractor community, and where government resources may be diverted in the reorganization process.

3.2 Prototype Approaches

A DoD-wide integrated database can be constructed logically and physically in multiple ways. The Finance Client/Server Guidelines discuss in detail the various models across which data management can be arrayed.

This document discusses three approaches for maximizing the current DoD inventory to develop a database capable of satisfying a DoD-wide requirement:

- Platform-Only Approach—the reuse of an existing technical platform, but not existing database structure or content

- Platform-and-Content Approach—the reuse of an existing technical platform and its existing database structure and content
- Software Interface Approach—the creation of a software interface to existing databases, leaving the existing structure and content unchanged

3.2.1 Platform-Only Approach

The platform-only alternative involves creation of a new database on an existing technical platform, without replication of the existing database population. This avenue would be considered if the platform was technically superior, and merited serving an expanded role as a model for DoD-wide databases.

An example would be the reuse of the Requirements Data Bank platform, but populating the database with civilian personnel data via an enterprise-driven model of that subject area provided by the functional community. Since this approach starts from an empty database, it provides the purest opportunity for creation of an enterprise-driven subject database, independent of existing application-driven structures.

However, since this is a new start, it would require mapping to the new database schema a wide range of data structures from multiple disparate databases which currently serve the designated subject area, with corresponding new or revised applications to populate and maintain the new database. There would be a continuing requirement to maintain integrity between all original and replicated versions of data.

3.2.2 Platform and Content Approach

This process would involve reuse of the technical platform and replication of the database content, with subsequent enhancement of the database by mapping and adding data instances from other data structures to the baseline structure. This might also involve the incremental addition of new elements (and their corresponding instances) to the database structure. In this scenario, the schema of the existing database would be used and a mirror copy of its data content would provide the baseline of the new database. Expansion of an existing database should be considered when the structure and content, as well as the underlying platform, are of merit.

An example of this approach would be the replication of the structure and content of a Defense Business Management System database, adding additional instances of data from the other pay/personnel systems.

Since this approach has an existing database as its core, it is also predicated upon an existing schema, which will be application rather than enterprise driven. However, this approach does provide a core of data that is replicated, thereby reducing the mapping

requirements. While the requirement to maintain integrity between all original and replicated versions of data would remain, the requirement would be satisfied more readily for the core data.

3.2.3 Software Interface Approach

Although outside the scope of this task, a third prototyping alternative exists which could be exploited across any number of functional areas. This alternative would provide a front-end interface ("middleware") to existing functional area databases in order to provide the "look and feel" of integration to functional users. The front-end interface can take many forms technically, ranging in sophistication from a "central data manager" which uses a directory to locate, access, and format cross-functional data in a real-time environment, to a data request, collection, and response system which uses existing utilities from UNIX and MVS systems to accept information requests, submit data gathering jobs remotely, and assemble and present the requested information in a "near realtime" environment.

Middleware functions through the compilation of the following pieces:

- A global data management piece with a single logical database for all physical databases with a global dictionary/directory
- Some form of intelligent query "builder"
- A common API, using SQL
- A gateway or specialized software application which accepts a query for a database & translates it into language understandable by the target DBMS
- A transport piece that carries queries and results between client and server via an agreed upon protocol
- Common user tools that can map to or use SQL

In all implementations, the intent is to provide the user a single coherent view of information from disparate platforms, thus providing a pragmatic incremental solution that capitalizes existing investments in legacy applications and data.

This approach should be considered where legacy database configurations are not suitable for perpetuation, but access to their content is critical. It also provides a way to "join" physically distinct databases which utilize the same DBMS.

As an example of the first case, middleware could be put in place to extract personnel information from the DCPDS flat files for use in an executive information system at the

enterprise level. An example of the latter would be the use of the CA-DB:STAR product to extract and synthesize information from multiple databases running under the Datacom/DB RDBMS.

There are advantages to this approach. Since data is accessed from its source, there is no replicated database, so the need to maintain replicated data is also removed. It also allows for incremental implementation of an enterprise view of data; the integrated data schema can be built from the enterprise model, and existing database structures mapped to it.

The disadvantage lies in the potential to adversely affect performance by increasing the access requirements on the legacy database. Also, there is an extensive amount of application tweaking involved to go to and from the middleware "box." Last, this technology is much more advanced in theory than in implementation, and current limited implementations tend to be proprietary.

3.3 Recommendations

3.3.1 Platform-Only Recommendations

Both CA-Datacom and Supra 2.0 would be technically suitable as model platforms for a new start database. In fact, there are other RDBMS configurations within the DoD, which do not currently contain integrated data but are potentially equally viable as models, as are any of the COTS DBMSs used for comparison. There is, however, a stated migration goal of minimizing supported platforms. To achieve that goal, preference should be given to a suitable platform which already exists in the environment where the data is managed rather than introducing an additional platform. That is, if personnel and payroll data are to be integrated, the platform upon which to accomplish that initiative should come, if possible, from those that currently support payroll and personnel requirements. A new platform should be introduced only when no satisfactory candidate exists within the payroll and personnel DBMS configurations.

An example of the steps necessary to pursue the Platform-Only Approach for development of a prototype is included at Appendix H.

3.3.2 Platform and Content Recommendations

SCS and RDB both employ the CA-Datacom platform. Their databases each serve multiple logistics activities, and thus might be considered to be integrated intra-functionally, rather than cross-functionally. In both cases, they also indicated that data in their databases might have potential value to other functional areas, but they are not currently serving a cross-functional role as migration systems. With the expansion of

RDB or SCS beyond its current Air Force role to the other services, this platform could serve as a prototype for expansion to encompass a DoD-wide workload, albeit an intra-functional rather than cross-functional one. SCS and RDB also have numerous documented agreements for data exchanges with other systems, so there is an apparent need to expand direct access capability for these systems.

Defense Business Management System, on the other hand, is a migration system which has an integrated database currently serving two distinct operational functions: payroll and personnel. With acceleration of prototype implementation as the critical element, Defense Business Management System provides an integrated baseline from which to start.

The Defense Business Management System recommendation is contingent upon successful completion of their planned upgrade to the 2.0 version of the Cincom Supra product in a timeframe acceptable to accelerated database implementation targets. The current configuration is not considered acceptable for DoD-wide migration purposes.

An example of the steps necessary to pursue the Platform-and-Content Approach to development of a prototype is included at Appendix I.

3.3.3 Software Interface Recommendations

In order to prototype a specific interfacing approach, further technical research would be required in order to define alternative methods, ascertain their technical feasibility, determine associated costs, and relate each alternative approach to specific functional requirements for the "look and feel" of integrated data.

There are numerous ongoing efforts within the Department of Defense to pursue the software interface or middleware approach. One example is the JCALS program. The Office of Technical Integration recently completed a draft evaluation of the reuse potential of the JCALS program, which specifically addresses the JCALS Global Data Management System (GDMS) to access heterogeneous databases.

A review of the platforms included in this survey reveals the following potential candidates for further consideration in this approach:

- Datacom's CA-DB:STAR for access to Datacom RDBMSs.
- MOCAS Contractor Profile subsystem, which currently uses a government-developed product, Openlink, to collect and present data from multiple databases
- The expressed requirement for an enterprise view of personnel data, which is currently primarily located in flat files

If the Software Interface Approach is to be pursued, the steps in that direction are detailed in Appendix J.

3.3.4 Other Recommendations

The assessments provided insight into innovative solutions developed by the CDAs which should be further reviewed for inclusion in the solution toolkit as database integration occurs.

- MCTFS has developed PC applications in Ada for the front-end aggregation of transactions
- MCTFS appears to be well-positioned as a candidate for migration to a new database, since of those reviewed it had made a conscious effort in design and development to confine data accesses to a single module.
- MOCAS has in production a subsystem named Contractor Profile which uses an in-house developed interface called OpenLink to access and draw data from different databases and file systems on different hardware platforms.
- DLA is currently employing an in-house developed product to extract information from the spools which spawn hardcopy reports, and present that information on the user's terminal screen.

Chapter 4

Conclusion

This document provides assessments and prototype recommendations based strictly upon technical evaluation criteria, and thus provides an incomplete picture of database integration issues. For example, documentation of data requirements and standardization of data names are functional responsibilities. However, these functional issues have technical ramifications, user connectivity and physical mapping to name but two, which can only be accurately assessed by tapping functional knowledge to augment technical conclusions.

The final decision on any prototype candidate(s) must be reached jointly with the functional community to preclude adoption of a technical solution that is unacceptable functionally, or a functional solution that is technically undoable. Additionally, the acceleration of cross-functional database creation is best achieved by a marriage of available technical capability to available functional products. Consensus of the functional and technical communities is considered to be a critical success factor in the selection and implementation of prototype candidates.

Appendix A

Task Order

October 09, 1992

Technical Suitability and Prototype Evaluation for Integrated Databases.

Contractor Responsibilities

1. Create an Evaluation Matrix based on the current technical environment for the selected DBMS and on the information contained in the DBMS survey. The Candidate DBMS will be compared to selected COTS DBMS. The COTS DBMS will be used as a baseline. The COTS DBMS criteria will be based on published specifications. Information in the TRM will be mapped to the survey and correlated where possible. If the information in the surveys does not map to the TRM, it will be a separate row in the matrix. An example is as follows:

			DBMS CANDIDATE		COTS DBMS		
SPECIFICATION	TRM	SURVEY	DBMS	JDMPS	PDS	ORACLE	INGRESS
Programming Language	ADA	3GL 4GL	X		X		X
:							

A. Steps to produce the matrix are as follows:

1. Collect Data
2. Correlate OTI data collection survey with the TRM Summary Matrix
3. Select COTS DBMS
4. Populate the matrix with either an "x" or a "y/n"

2. Resources required for this activity are:

   A. Data Base Administrator 1 (80 Hours)

3. Schedule

   A. A draft of the matrix will be provided to the OTI on 10/13/92.

   B. Completed Matrix—TBD

Appendix B

System Characteristics

SYSTEM:DCPDS

SYSTEM CONFIGURATION

VENDOR DATABASE SYSTEM NAME	UNISYS DMS 1100 Version 12R2
FILE STRUCTURE	Hierarchical
MEMORY REQUIREMENT	
CURRENT SIZE	12.2 GB
HARDWARE/OS	UNISYS OS1100 SB4
TELEPROCESSING MONITOR	
AVERAGE CONCURRENT USERS MAXIMUM CONCURRENT USERS	500 9,995 AF-Wide
AVERAGE TRANSACTIONS PER DAY	

VENDOR DATABASE SYSTEM NAME	 UNIFY Version 1.1.1.7G/1.1.1.7GR
FILE STRUCTURE	Relational
MEMORY REQUIREMENT	32-64 MB
CURRENT SIZE	1-2.1 GB
HARDWARE/OS	3B2/UNIX 3.2/ES SVR4/ER
TELEPROCESSING MONITOR	
AVERAGE CONCURRENT USERS MAXIMUM CONCURRENT USERS	20 64
AVERAGE TRANSACTIONS PER DAY	Unknown

SYSTEM: DCPDS

APPLICATION ENVIRONMENT

LANGUAGE			PRESENT		FUTURE	
			Required	Supported	Required	Supported
3/GL	Ada (3B2)		Yes	Yes	Yes	Yes
	C (3B2)		Yes	Yes	Yes	Yes
	COBOL (UNISYS)		Yes	Yes	Yes	Yes
	FORTRAN					
	OTHER—PL1 HAF (BULL)		Yes	Yes		
4/GL	ACCELL, ATLAS, FOCUS		Yes	Yes	Yes	Yes
	FORMS, RPT		Yes	Yes	Yes	Yes
APPLICATION CODE RESIDENCY	MAINFRAME/MINI			Yes		Yes
	PC			Yes		Yes
SOFTWARE INTERFACE	COTS S/W		Yes	Yes	Yes	Yes
	NON-COTS S/W		Yes	Yes	Yes	Yes
SYSTEM SPECIFIC FUNCTION CALLS USED	Yes					
CASE TOOLS	CADRE's TEAMWORK					
UTILITIES USED TO EDIT HOST STRUCTURES ON A PC	None					
AVAILABLE APPLICATION DOCUMENTATION	Structure Tree	Yes				
	Program Design Language —Pseudo Code	Yes				
	Other Structured Design Documentation	No				

SYSTEM: DCPDS (UNISYS)

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		No	No	Yes	Yes
Ada		No	No	Yes	Yes
RDA		No	No	Yes	Yes
POSIX	UNISYS Environment	No	No	Yes	Yes
SNMP		No	No	Yes	Yes
IRDS		No	No	Yes	Yes
GOSIP		No	No	Yes	Yes
DISTRIBUTED DATABASE	No	No	No	Yes	Yes
CLIENT / SERVER		No	No	Yes	Yes
OPERATING SYSTEM SECURITY	C2—92	Yes	No	Yes	Yes
DBMS SECURITY	C2 (DMS 1100)	Yes	No	Yes	Yes
APPLICATION SYSTEM SECURITY	C2	Yes	No	Yes	Yes
DATA ENCRYPTION	AUTODIN	Yes	Yes	Yes	Yes

SYSTEM: DCPDS (3B2)

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		Yes	Yes	Yes	Yes
Ada		Yes	Yes	Yes	Yes
RDA				Yes	Yes
POSIX	3B2 Environment	Yes	Yes	Yes	Yes
SNMP		No	No	Yes	Yes
IRDS		No	No	Yes	Yes
GOSIP	Partial Compliance			Yes	Yes
DISTRIBUTED DATABASE	No			Yes	Yes
CLIENT / SERVER		No	No	Yes	Yes
OPERATING SYSTEM SECURITY	C2—92	Yes	No	Yes	Yes
DBMS SECURITY	C2	Yes	No	Yes	Yes
APPLICATION SYSTEM SECURITY	C2	Yes	No	Yes	Yes
DATA ENCRYPTION	AUTODIN	Yes	Yes	Yes	Yes

SYSTEM: PDS—BLPS (UNISYS)/PC-III (3B2)

SYSTEM CONFIGURATION

VENDOR	UNISYS
DATABASE SYSTEM NAME	DMS 1100 Version 12R2
FILE STRUCTURE	Hierarchical
MEMORY REQUIREMENT	
CURRENT SIZE	15 GB
HARDWARE/OS	UNISYS 1100 & 2200/OS1100SB4
TELEPROCESSING MONITOR	
AVERAGE CONCURRENT USERS MAXIMUM CONCURRENT USERS	500 9,995 AF-Wide
AVERAGE TRANSACTIONS PER DAY	

VENDOR	
DATABASE SYSTEM NAME	UNIFY Version 1.1.1.7G/1.1.1.7GR
FILE STRUCTURE	Relational
MEMORY REQUIREMENT	32-64 MB
CURRENT SIZE	Unknown
HARDWARE/OS	3B2/UNIX ES SVR4/ER 4.2
TELEPROCESSING MONITOR	
AVERAGE CONCURRENT USERS MAXIMUM CONCURRENT USERS	20 64
AVERAGE TRANSACTIONS PER DAY	4833

SYSTEM: PDS—HAF (Honeywell)

SYSTEM CONFIGURATION

VENDOR	HONEYWELL (BULL)
DATABASE SYSTEM NAME	DM IV
FILE STRUCTURE	CODASYL STANDARD NETWORK
MEMORY REQUIREMENT	
CURRENT SIZE	15 GB
HARDWARE/OS	BULL DPS8000 GCOS8
TELEPROCESSING MONITOR	TP-8
AVERAGE CONCURRENT USERS	200
MAXIMUM CONCURRENT USERS	750
AVERAGE TRANSACTIONS PER DAY	80K

SYSTEM: PDS—BLPS (UNISYS)/PC-III (3B2)

APPLICATION ENVIRONMENT

LANGUAGE			PRESENT		FUTURE	
			Required	Supported	Required	Supported
3/GL	Ada (3B2)		Yes	Yes	Yes	Yes
	C (3B2)		Yes	Yes	Yes	Yes
	COBOL (UNISYS)		Yes	Yes	Yes	Yes
	FORTRAN					
	OTHER—PL1 HAF (BULL)		Yes	Yes		
4/GL	ACCELL, ATLAS, FOCUS		Yes	Yes	Yes	Yes
	FOCUS, FORMS, RPT, SAS		Yes	Yes	Yes	Yes
APPLICATION CODE RESIDENCY	MAINFRAME/MINI			Yes		Yes
	PC			Yes		Yes
SOFTWARE INTERFACE	COTS S/W			Yes		Yes
	NON-COTS S/W			Yes		Yes
SYSTEM SPECIFIC FUNCTION CALLS USED	Yes					
CASE TOOLS	CADRE's TEAMWORK					
UTILITIES USED TO EDIT HOST STRUCTURES ON A PC	None					
AVAILABLE APPLICATION DOCUMENTATION	Structure Tree	Yes				
	Program Design Language —Pseudo Code	Yes				
	Other Structured Design Documentation	No				

SYSTEM: PDS—HAF (Honeywell)

APPLICATION ENVIRONMENT

LANGUAGE			PRESENT		FUTURE	
			Required	Supported	Required	Supported
3/GL	Ada		No	No	Yes	Yes
	C		No	No	No	No
	COBOL		Yes	Yes	Yes	Yes
	FORTRAN					
	OTHER—PL1		Yes	Yes	No	No
4/GL	ACCELL, ATLAS, DESIRE		Yes	Yes	Yes	Yes
	FOCUS, FORMS, RPT, SAS		Yes	Yes	Yes	Yes
APPLICATION CODE RESIDENCY	MAINFRAME/MINI			Yes		Yes
	PC		No	No	No	Yes
SOFTWARE INTERFACE	COTS S/W		Yes	Yes	Yes	Yes
	NON-COTS S/W		Yes	Yes	Yes	Yes
SYSTEM SPECIFIC FUNCTION CALLS USED	Yes					
CASE TOOLS	No					
UTILITIES USED TO EDIT HOST STRUCTURES ON A PC	None (?)					
AVAILABLE APPLICATION DOCUMENTATION	Structure Tree	Yes				
	Program Design Language —Pseudo Code	Yes				
	Other Structured Design Documentation	No				

SYSTEM: PDS—BLPS (UNISYS)

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		No	No	Yes	Yes
Ada		Yes	No	Yes	Yes
RDA		No	No	Yes	Yes
POSIX		No	No	Yes	Yes
SNMP		No	No	Yes	Yes
IRDS		No	No	Yes	Yes
GOSIP		No	No	Yes	Yes
DISTRIBUTED DATABASE	No	No	No	Yes	Yes
CLIENT / SERVER		No	No	Yes	Yes
OPERATING SYSTEM SECURITY	Near C2—92	Yes	No	Yes	Yes
DBMS SECURITY	C2 (DMS 1100)	Yes	No	Yes	Yes
APPLICATION SYSTEM SECURITY	C2	Yes	No	Yes	Yes
DATA ENCRYPTION	AUTODIN	Yes	Yes	Yes	Yes

SYSTEM: PDS—PC-III (3B2)

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		Yes	Yes	Yes	Yes
Ada		Yes	Yes	Yes	Yes
RDA				Yes	Yes
POSIX	3B2 Environment	No	Yes	Yes	Yes
SNMP		No	No	Yes	Yes
IRDS		No	No	Yes	Yes
GOSIP	Partial Compliance			Yes	Yes
DISTRIBUTED DATABASE	No			Yes	Yes
CLIENT / SERVER		No	No	Yes	Yes
OPERATING SYSTEM SECURITY	C2—92	Yes	No	Yes	Yes
DBMS SECURITY	C2	Yes	No	Yes	Yes
APPLICATION SYSTEM SECURITY	C2	Yes	No	Yes	Yes
DATA ENCRYPTION	AUTODIN	Yes	Yes	Yes	Yes

SYSTEM: PDS—HAF (Honeywell)

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		No	No	Yes	Yes
Ada		No	No	Yes	Yes
RDA		No	No	Yes	Yes
POSIX		No	No	Yes	Yes
SNMP		No	No	Yes	Yes
IRDS		No	No	No	No
GOSIP		No	No	Yes	Yes
DISTRIBUTED DATABASE	No	No	No	Yes	Yes
CLIENT / SERVER		No	No	Yes	Yes
OPERATING SYSTEM SECURITY	Near C2—92	Yes	No	Yes	Yes
DBMS SECURITY	C2	Yes	No	Yes	Yes
APPLICATION SYSTEM SECURITY	C2	Yes	No	Yes	Yes
DATA ENCRYPTION	AUTODIN	Yes	Yes	Yes	Yes

SYSTEM: SCS

SYSTEM CONFIGURATION

VENDOR	COMPUTER ASSOCIATES
DATABASE SYSTEM NAME	DATACOM/DB Version 8.0
FILE STRUCTURE	Relational
MEMORY REQUIREMENT	6 MB
CURRENT SIZE	125 GB
HARDWARE/OS	IBM Compatible 9000 Series/MVS
	IBM Compatible 3090 Series/MVS
TELEPROCESSING MONITOR	CICS 1.7
AVERAGE CONCURRENT USERS	500
MAXIMUM CONCURRENT USERS	1,000
AVERAGE TRANSACTIONS PER DAY	

SYSTEM: SCS

APPLICATION ENVIRONMENT

LANGUAGE			PRESENT		FUTURE	
			Required	Supported	Required	Supported
3/GL	Ada		Yes	Yes	Yes	Yes
	C		No	Yes	Yes	Yes
	COBOL		Yes	Yes	Yes	Yes
	FORTRAN		No	Yes	No	Yes
	OTHER —PL1		No	Yes	No	Yes
	—ASSEMBLER		No	Yes	No	Yes
4/GL	IDEAL		Yes	Yes	Yes	Yes
APPLICATION CODE RESIDENCY	MAINFRAME/MINI			Yes		Yes
	PC			Yes		Yes
SOFTWARE INTERFACE	COTS S/W		Yes	Yes	Yes	Yes
	NON-COTS S/W					
SYSTEM SPECIFIC FUNCTION CALLS USED	None					
CASE TOOLS	CADRE's TEAMWORK CA CASELINK CA TELON					
UTILITIES USED TO EDIT HOST STRUCTURES ON A PC	DATACOM/PC					
AVAILABLE APPLICATION DOCUMENTATION	Structure Tree	Yes				
	Program Design Language —Pseudo Code	Yes				
	Other Structured Design Documentation	Yes				

SYSTEM: SCS

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		No	Yes	Yes	Yes
Ada		No	Yes	Yes	Yes
RDA	Not to Standard	No	Yes		
POSIX				No	Yes
SNMP					
IRDS					
GOSIP	CICS (SNA)				
DISTRIBUTED DATABASE		No	Yes	Yes	Yes
CLIENT / SERVER		No	No		
OPERATING SYSTEM SECURITY	C2	Yes		Yes	Yes
DBMS SECURITY	CA's TOP SECRET	Yes		Yes	Yes
APPLICATION SYSTEM SECURITY	Near C2—92	Yes			
DATA ENCRYPTION	CICS & Application EXIT	No	Yes	No	Yes

SYSTEM: RDB

SYSTEM CONFIGURATION

VENDOR	**COMPUTER ASSOCIATES**
DATABASE SYSTEM NAME	**DATACOM/DB Version 8.0**
FILE STRUCTURE	Relational
MEMORY REQUIREMENT	8 MB
CURRENT SIZE	
HARDWARE/OS	IBM 3090/MVS-XA
TELEPROCESSING MONITOR	CICS 1.7
AVERAGE CONCURRENT USERS	
MAXIMUM CONCURRENT USERS	
AVERAGE TRANSACTIONS PER DAY	

SYSTEM: RDB

APPLICATION ENVIRONMENT

LANGUAGE			PRESENT		FUTURE	
			Required	Supported	Required	Supported
3/GL	Ada		No	Yes	Yes	Yes
	C		No	Yes		Yes
	COBOL		Yes	Yes		Yes
	FORTRAN		Yes	Yes		Yes
	OTHER—ASSEMBLER		Yes	Yes		Yes
4/GL	IDEAL		Yes	Yes		Yes
APPLICATION CODE RESIDENCY	MAINFRAME/MINI			Yes		Yes
	PC					Yes
SOFTWARE INTERFACE	COTS S/W		No	Yes		Yes
	NON-COTS S/W					
SYSTEM SPECIFIC FUNCTION CALLS USED	Some via A&S Software					
CASE TOOLS	DESIGN RECOVERY EXCELERATOR					
UTILITIES USED TO EDIT HOST STRUCTURES ON A PC	None					
AVAILABLE APPLICATION DOCUMENTATION	Structure Tree	Yes				
	Program Design Language —Pseudo Code	Yes				
	Other Structured Design Documentation	Yes				

SYSTEM: RDB

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL			Yes	Yes	Yes
Ada		No	Yes	Yes	Yes
RDA	Not to Standard	No	Yes		
POSIX		No		No	Yes
SNMP		Yes	Yes		
IRDS		No	No	No	No
GOSIP	SNA X.25				
DISTRIBUTED DATABASE		No	Yes		Yes
CLIENT / SERVER		No	No		
OPERATING SYSTEM SECURITY	C2	Yes		Yes	Yes
DBMS SECURITY	External to DBMS	No		No	No
APPLICATION SYSTEM SECURITY	C2				
DATA ENCRYPTION		No	Yes	No	Yes

SYSTEM: Defense Business Management System

SYSTEM CONFIGURATION

VENDOR	CINCOM
DATABASE SYSTEM NAME	TIS Version 1.6
FILE STRUCTURE	Network
MEMORY REQUIREMENT	11 MB (Largest)
CURRENT SIZE	3 GB
HARDWARE/OS	AMDAHL Series 5880/MVS-XA
TELEPROCESSING MONITOR	CINCOM CM Version 1.6
AVERAGE CONCURRENT USERS	300
MAXIMUM CONCURRENT USERS	2,000
AVERAGE TRANSACTIONS PER DAY	100,000

VENDOR	CINCOM
DATABASE SYSTEM NAME	SUPRA Version 1.3.5
FILE STRUCTURE	Relational
MEMORY REQUIREMENT	
CURRENT SIZE	
HARDWARE/OS	IBM Compatible Series 3090/MVS-XA
TELEPROCESSING MONITOR	CINCOM CM Version 1.6
AVERAGE CONCURRENT USERS	500
MAXIMUM CONCURRENT USERS	5,000
AVERAGE TRANSACTIONS PER DAY	

SYSTEM: Defense Business Management System

APPLICATION ENVIRONMENT

LANGUAGE			PRESENT		FUTURE	
			Required	Supported	Required	Supported
3/GL	Ada		No	No	Yes	Yes
	C		Yes	Yes	Yes	Yes
	COBOL		Yes	Yes	Yes	Yes
	FORTRAN					
	OTHER — BASIC		Yes	Yes	To 1995	
	— SQL				Yes	Yes
4/GL	MANTIS		Yes	Yes	Yes	Yes
	ACCELL		Yes	Yes	Yes	Yes
APPLICATION CODE RESIDENCY	MAINFRAME/MINI			Yes		Yes
	PC			Yes		Yes
SOFTWARE INTERFACE	COTS S/W		Yes	Yes	Yes	Yes
	NON COTS S/W		Yes	Yes	Yes	Yes
SYSTEM SPECIFIC FUNCTION CALLS USED						
CASE TOOLS	Knowledgeware, PM/SS CASE 2000, AD/ADVANTAGE INSPECTION RECORDER					
UTILITIES USES TO EDIT HOST STRUCTURES ON A PC	None					
AVAILABLE APPLICATION DOCUMENTATION	Structure Tree	Partial				
	Program Design Language —Pseudo Code	Partial				
	Other Structured Design Documentation	Partial (see Note)				

NOTE: Available documentation includes Decomposition Diagrams, DFDs, Structure Charts, Module Action Diagrams, Logical and Physical Entity Relationship Diagrams and reusable specifications and program modules.

SYSTEM: Defense Business Management System

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		Yes	Yes	Yes	Yes
Ada		No	No		
RDA		No	No	Yes	Yes
POSIX		Yes	Yes	Yes	Yes
SNMP		No	No	No	No
IRDS		No	No		
GOSIP	Partial Compliance				
DISTRIBUTED DATABASE		No	No		Yes
CLIENT / SERVER					
OPERATING SYSTEM SECURITY	C2	Yes			
DBMS SECURITY	Near C2—92	Yes		Yes	Yes
APPLICATION SYSTEM SECURITY	Near C2—92	Yes		Yes	Yes
DATA ENCRYPTION		Yes	Yes	Yes	Yes

SYSTEM: MOCAS

SYSTEM CONFIGURATION

VENDOR DATABASE SYSTEM NAME	CINCOM TIS Version 1.6
FILE STRUCTURE	Network
MEMORY REQUIREMENT	10.5 MB (Largest)
CURRENT SIZE	30 GB
HARDWARE/OS	AMDAHL Series 580/MVS-XA
TELEPROCESSING MONITOR	CINCOM CM Version 1.6
AVERAGE CONCURRENT USERS	1,010
MAXIMUM CONCURRENT USERS	1,500
AVERAGE TRANSACTIONS / DAY	360,000

VENDOR DATABASE SYSTEM NAME	CINCOM SUPRA Version 1.3
FILE STRUCTURE	Relational
MEMORY REQUIREMENT	
CURRENT SIZE	
HARDWARE/OS	AMDAHL Series 5995/MVS-ESA
TELEPROCESSING MONITOR	CINCOM CM Version 1.6
AVERAGE CONCURRENT USERS	1,500
MAXIMUM CONCURRENT USERS	6,000
AVERAGE TRANSACTIONS PER DAY	

SYSTEM: MOCAS

APPLICATION ENVIRONMENT

LANGUAGE			PRESENT		FUTURE	
			Required	Supported	Required	Supported
3/GL	Ada		No	No	Yes	Yes
	C		Yes	Yes	Yes	Yes
	COBOL		Yes	Yes	Yes	Yes
	FORTRAN					
	OTHER — SQL		No	No	Yes	Yes
4/GL	MANTIS		Yes	Yes	Yes	Yes
	ACCELL		Yes	Yes	Yes	Yes
APPLICATION CODE RESIDENCY	MAINFRAME/MINI			Yes		Yes
	PC					
SOFTWARE INTERFACE	COTS S/W		Yes	Yes	Yes	Yes
	NON-COTS S/W		Yes	Yes	Yes	Yes
SYSTEM SPECIFIC FUNCTION CALLS USED	None					
CASE TOOLS	Texas Instrument's IEF					
UTILITIES USED TO EDIT HOST STRUCTURES ON A PC	PC/NFS, FTP, FT/TSO					
AVAILABLE APPLICATION DOCUMENTATION	Structure Tree	Yes				
	Program Design Language —Pseudo Code	No				
	Other Structured Design Documentation	No				

SYSTEM: MOCAS

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		No	No	Yes	Yes
Ada		No	No	Yes	Yes
RDA	No known requirement	No	No	No	
POSIX		No	No	Yes	Yes
SNMP		No	No		
IRDS		No	No		
GOSIP	Partial Compliance				
DISTRIBUTED DATABASE		No	No		Yes
CLIENT / SERVER	3B2/IBM MVS PC/3B2	Yes	Yes	Yes	Yes
OPERATING SYSTEM SECURITY	C2	No			
DBMS SECURITY	Near C2—92	Yes		Yes	Yes
APPLICATION SYSTEM SECURITY	Near C2—92	Yes		Yes	Yes
DATA ENCRYPTION	AUTODIN	Yes	Yes	Yes	Yes

SYSTEM: MCTFS

SYSTEM CONFIGURATION

VENDOR	**Software AG**
DATABASE SYSTEM NAME	**ADABAS Version 5.18**
FILE STRUCTURE	Inverted List
MEMORY REQUIREMENT	10 MB
CURRENT SIZE	55 GB
HARDWARE/OS	3090/MVS-XA
TELEPROCESSING MONITOR	CICS 1.7
AVERAGE CONCURRENT USERS	150
MAXIMUM CONCURRENT USERS	500
AVERAGE TRANSACTIONS PER DAY	7 Million

SYSTEM: MCTFS

APPLICATION ENVIRONMENT

LANGUAGE			PRESENT		FUTURE	
			Required	Supported	Required	Supported
3/GL	Ada		Yes	Yes	Yes	Yes
	C					
	COBOL		Yes	Yes	Yes	Yes
	FORTRAN					
	OTHER —ALC		Yes	Yes	Yes	Yes
4/GL	NATURAL		Yes	Yes	Yes	Yes
	FOCUS		No	Yes		
APPLICATION CODE RESIDENCY	MAINFRAME/MINI			Yes		Yes
	PC			Yes		Yes
SOFTWARE INTERFACE	COTS S/W		Yes	Yes		
	NON-COTS S/W					
SYSTEM SPECIFIC FUNCTION CALLS USED	Yes					
CASE TOOLS	Not specified					
UTILITIES USED TO EDIT HOST STRUCTURES ON A PC	None					
AVAILABLE APPLICATION DOCUMENTATION	Structure Tree	No				
	Program Design Language —Pseudo Code	No				
	Other Structured Design Documentation	Yes				

SYSTEM: MCTFS

STANDARDS COMPLIANCE

STANDARD	COMMENT	PRESENT		FUTURE	
		Required	Supported	Required	Supported
SQL		No	No	Yes	Yes
Ada		Yes	Yes		
RDA		No	No		
POSIX		No	No	Yes	Yes
SNMP		No	No	Yes	Yes
IRDS		No	Yes		Yes
GOSIP	Not Compliant				
DISTRIBUTED DATABASE		Yes	Yes	Yes	Yes
CLIENT / SERVER		No	No		
OPERATING SYSTEM SECURITY	C2	Yes		Yes	Yes
DBMS SECURITY	C2	Yes		Yes	Yes
APPLICATION SYSTEM SECURITY					
DATA ENCRYPTION		No	No	No	No

Appendix C

COTS Database Information

SYSTEM CONFIGURATION

DATABASE INFORMATION		Sharebase III	ORACLE	DB2	SUPRA
Vendor		NCR	ORACLE	IBM	CINCOM
File Structure		Relational	Relational	Relational	Relational
Version			6.2	V2R3	2.1
Memory Requirement		64 MB (Minimum)	4 MB MVS		
Maximum Data Storage		100 GB Total		64 GB/Table	
Concurrent Users	Average	Memory Dependent			
	Maximum			2000	

COTS Database Information

HARDWARE

DATABASE INFORMATION			Sharebase III	ORACLE	DB2	SUPRA
VENDOR	PLATFORM	OPERATING SYSTEM				
AT&T	7000	OsX	Yes	Yes		Yes
	3B2	UNIX V	Yes	Yes		Yes
DIGITAL	VAX	VMS	Yes	Yes		Yes
IBM	370	MVS	Yes	Yes	Yes	Yes
	390	MVS	Yes	Yes	Yes	Yes
	IBM PC	DOS		Yes		Yes
		WINDOWS 3.0	Yes			
		OS/2		Yes	Yes	
PYRAMID		OsX	Yes	Yes		Yes
SUN		SUN OS	Yes	Yes		Yes

COTS Database Information

APPLICATION ENVIRONMENT

LANGUAGE SUPPORT		Sharebase III	ORACLE	DB2	SUPRA
3/GL	Ada		Yes		Future
	C	Yes	Yes		Yes
	COBOL	Yes	Yes	Yes	Yes
	FORTRAN		Yes	Yes	Yes
	OTHER		PL1, BASIC	PL1, LISP	Yes
4/GL			SQL*PLUS		MANTIS
Application code residency	Mainframe/Mini	Yes	Yes	Yes	Yes
	PC	Yes	Yes	OS/2	Yes
Software interface	COTS S/W	Yes			
	Non COTS S/W	Yes			
CASE Tools			Several		Several

COTS Database Information

STANDARD COMPLIANCE

STANDARD	COMMENT	Sharebase III	ORACLE	DB2	SQL/DS
SQL		ANSI/ISO SQL2	FIPS PUB 127-1	Industry Standard	
Ada			Yes		Future
RDA	DBMS Product/Requirement		SQL*Connect	RUOW	DRDM
POSIX					
SNMP					
IRDS		Partial	Partial	Partial	Partial
GOSIP		XNA,TCP/IP	SQL*NET	SAA Based	CICS, TCP/IP
CLIENT/SERVER		Is a server	Yes	Minimal	DRDM
DISTRIBUTED DATABASE			SQL*Connect	Same Network Only	Yes
DBMS SECURITY		SQL Grant	SQL Grant	SQL Grant	No Information
DATA ENCRYPTION					

Appendix D

DoD-Wide Database Information

DATABASE INFORMATION	Defense Business Management System	MOCAS	DCPDS (UNISYS)	DCPDS (UB2)	PDS (UNISYS)	PDS (Ultrix/Oracle)	RDB	SCS	MICTS
Name	CINCOM TIS	CINCOM TIS	UNISYS DMS 1100	UNIFY	UNISYS DMS 1100	DM-IV	Computer Associates DATACOM/DB Relational	Computer Associates DATACOM/DB Relational	Software AG ADABAS
Type	Network	Network	Hierarchy	Relational	Hierarchy	Hierarchy			Inverted List
Current Size (Volume)	3 GB	30 GB	12.2 GB		6.2 GB	15 GB	-	125 GB	-
Current Records	-	-	1.2 Million		898,000	3.6 Million	-	-	48 Million
DoD Wide Size	10—20 GB	60-90 GB	9.9 GB DoD Personnel Only		28.1 GB	28.1 GB	595 GB	400 GB	55 GB
DoD Wide Records	-	-			-	-	-	-	-
Shareable data entities across business activities	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data Interface (On Line/Batch)	Both	Both	Both	On-line	Batch	Both	Batch	Both	Both
Data Integration (Logical/Physical)	Both	Both	Both	Both	Both	Both	-	-	Physical
Data Batch Interface Media	DASD-3380	DASD	AutoDin, DISN	DDN, DISN	AutoDin, DISN	AutoDin, DISN	N/A	N/A	No
Integrity enforcement (DBMS/Application)	DBMS	Application	Application	Application	Application	Application	Both	Application	Application
DBMS/Application inter-dependency	Moderate	High	High	High	High	High	High	High	Moderate

DATABASE INFORMATION	Defense Business Management System	MOCAS	DCPDS (UNISYS)	DCPDS (GEI)	PDS (UNISYS)	PDS (Honeywell)	RDB	NSO
Technical environment provides for DoD-Wide capacity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Specific hardware configuration required for DBMS	Any IBM compatible environment	Yes	Yes, currently	Yes, currently	Yes, currently	Yes, currently	Yes	Yes	No
Data Integration/ Management Control	Tis Directory	TIS Directory	FDMS		FDMS	DTBP	CD/D	CD/D	Dictionary
Proprietary Software Required	MANTIS for current on-line screens	MANTIS for current on-line screens	Yes, currently	Yes, currently	Yes, currently	Yes, currently	IDEAL currently used	IDEAL currently used	NATURAL currently used

Appendix E
Acquisition Information

SYSTEM DATABASE INFORMATION	Defense Business Management System	MOCAS	DCPDS (UNISYS)	DCPDS (3B2)	PDS (UNISYS)	PDS-HAF (Honeywell)	RDB	SCS	AMCTIS
License acquisition vehicle in place to purchase additional copies of DBMS for migration.	Yes, additional licenses may be available	Yes, additional licenses may be available	Yes	Yes	Yes	No	Yes	Yes	No
Above License support purchase of additional monitors, security software, operating systems	No, separate from above	No, separate from above	Yes	Yes	Yes	No	No	No, separate from above	No
Acquisition vehicle available to purchase additional hardware, e.g., communications equipment	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	
Are Planned Procurements in process	Yes		No		No	No	Yes	Yes	
Existing Contract Type	Requirements	Requirements	Requirements (A/F only)	Requirements (A/F only)	Requirsments (A/F only)	Requirements (A/F only)	N/A	Fixed Price	
Existing Contract Number	Yes	Yes	Yes	Yes	Yes	Yes		Yes	
Contract Term and Expiration	2 yr/3 yr opt'n 03-SEP-92	2 yr/3 yr 03-SEP-92	5 yr (01-97)	FY 93	5 yr (01-97)	FY 96		4th Qtr 94	
How licensed (CPU/Site)	Site	Site	CPU	CPU	CPU	Site		CPU Future Site Currently 6	
Number of Licenses	DISA-Wide	DISA-Wide	500—900	500—900	500—900				
Existing License(s) Renewable	Maintenance	Maintenance	Yes	Yes	Yes	Yes		Some	
Quantity Discounts Available	Yes	Yes	Some	Some	Some	Some		Some	

Appendix F

Compliance with DoD TRM Summary

			DATA MANAGEMENT						PROGRAMMING						USER INTERFACE		NETWORK		SECURITY	
			DICTIONARY		DBMS		RDA		LANGUAGE				CASE TOOL		CLIENT/ SERVER		DATA COMMUNICATION		SECURITY	
									SQL		Ada									
		SELECTION	3.3.3.1		3.3.3.2		3.3.3.3		3.3.1.1				3.3.1.2		3.3.2.1		3.3.6.1			
SYSTEM	SUB-SYSTEM	DBMS	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F
DBMS		CINCON TIS	▒		▒														C2	
		CINCON SUPRA 1		▒		■		■		▒		■		▒						C2
		UNIFY 2000							■											
		Environment					N	N	N	N	N	■	▒		N		▒		C2	C2
MOCAS		CINCOM TIS	▒		▒														C2	
		CINCOM SUPRA1		▒		■		■		▒		■		▒						C2
		Environment					N	N	N	N	N	■	■		▒		▒		C2	C2
DCPDS	BLPS	DMS 1100			▒														C2	
	PC-III	UNIFY																		
		Environment	▒			■	N		▒	▒	▒	■	▒		N	▒	▒		C2	C2

LEGEND: ■ Full Compliance ▒ Partial Compliance □ Not Compliant N Not Used/Required P Present F Future

			DATA MANAGEMENT						PROGRAMMING						USER INTERFACE		NETWORK		SECURITY	
			DICTIONARY		DBMS		RDA		LANGUAGE				CASE TOOL		CLIENT/ SERVER		DATA COMMUNICATION		SECURITY	
									SQL		Ada									
		SELECTION	3.3.3.1		3.3.3.2		3.3.3.3		3.3.1.1				3.3.1.2		3.3.2.1		3.3.6.1			
SYSTEM	SUB-SYSTEM	DBMS	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P	F
PDS	BLPS	DMS1100			▒														C2	
	HAF	IDS2			▒	N														
	PC-III	UNIFY																		
		Environment	▒			■	N		▒	■	▒	■	▒		N	▒	▒		C2	C2
RDB		DATACOM	▒		▒				■				▒	▒						C2
		Environment					N		N		N	■	▒		N	N	▒		C2	C2
SCS		DATACOM	▒		▒				■				▒	▒						C2
		Environment					▒	▒	N		N	▒	▒		N	N	▒		C2	C2
MCTFS		ADABAS	▒		▒				▒										C2	C2
		Environment	▒				▒		N	■	▒	■	N	▒			▒		C2	C2
COTS DBMS		NCR SHAREBASE III	▒		■		◙		■				◙		■		◙		C2	
		ORACLE	▒		■		■		▒				■		▒		■		C2	
		IBM DB2	▒		■		■		▒				▒		▒		■		C2	
		CINCOM SUPRA II	▒		■		■		■			■	▒		▒		■			C2

LEGEND:

■ Full Compliance
▒ Partial Compliance
□ Not Compliant
N Not Used/Required
■ SHAREBASE is a standalone DBMS Platform. Compliance to standard responsibility of CLINET HW/SW interfacing with SHAREBASE
P Present
F Future

Appendix G

Prototype Information

SYSTEM DATABASE INFORMATION	Defense Business Management System	MOCAS	DCPDS	PDS	RDB	[illegible]	MCTL
DBMS Compliance with Technical Reference Model	Partial	No	No	No	Partial	Partial	No
Distributed Database Environment Support	No	No	No	No	No	Yes	No
Database Data Transfer/Population via Transparent extract (Supported)	Not currently	Yes, using MILSCAP, RMIS	Yes	Yes	Yes	Yes	Yes
Multifunctional Business Activity Support	Yes	Yes	Yes, but is not done currently	Yes, but is not done currently	Yes	Yes	Yes
Technical Infrastructure and Technical Expertise to Support Expansion	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Overall DBMS Suitability as Target Environment	Not as currently deployed	Not as currently deployed	No	No	Yes	Yes	Yes
Suitability as Target Environment Using Incremental Approach/Modification	Yes, more so after SEP-93	Yes	Yes	Yes	-	-	-

Appendix H

Appendix of Steps for Platform-Only Approach

Determine subject area for database

Determine user access/connectivity requirements

Select a platform

Select a site

Assimilate necessary hardware/software

Create physical schema for database from logical model provided by functional community

Determine current data sources to be used to populate the database

Map current data sources to new database schema

Determine methods to be used to populate/refresh the database. Method should follow data exchange standards.

Provide initial query capability based upon functional requirement that conforms with workstation, communication, user interface guidance.

If proven, incrementally add to database content, query capability, and user base, based upon functional prioritization.

Appendix I

Appendix of Steps for Platform and Content Approach

Determine technical platform and core database to be used as baseline, driven by requirement of functional community

Determine site where expanded database will be prototyped

Designate CDA to be responsible for prototype effort

Determine user connectivity requirements

Assimilate necessary hardware/software (by procurement or MOU for use)

Establish technical platform which conforms to or progresses towards client/server guidance

Create mirror copy of core database on selected platform, based on models from functional and operational communities

Determine additional data sources to be added to the core database.

Determine methods to be used to populate/refresh the database. Method should follow data exchange standards.

Provide initial query capability based upon functional requirement that conforms with workstation, communication, user interface guidance.

If proven, incrementally add to database content, query capability, and user base, based upon functional prioritization.

Appendix J

Appendix of Steps for Software Interface Approach

1. Review currently ongoing middleware efforts, including but not limited to JCALS, Carnot Project, Honeywell, Hughes, with the intent of learning:

   - Methodologies
   - Components
   - Available contractual vehicles for components and expertise

2. Determine viable candidates from target community. Initial candidates should be small, well-defined, and narrow in scope.

3. Seek out windows of opportunity to incorporate DoD integrated database requirements into ongoing middleware projects.

Appendix K

Lessons Learned

Survey Instrument

- The questionnaire should be revisited and revised, where appropriate, prior to any further assessments.

- Many questions were ambiguous. Some questions were pulled from the Finance Migration surveys, and did not serve as well to cull out database information as they may have for the more generalized requirements of the Finance teams.

- Questions of the Present/Future/Required/Supported format were confusing, and the responses varied. For example, did required mean "had to use," as in the Ada mandate, or what the local site required, or what the DBMS required, or a functional requirement? This inconsistency in responses led to difficulty in the construction of both the format and content of the matrices.

- There was confusion in framing responses on capabilities of the DBMS. For example, in some cases, it was unclear whether the question addressed what the DBMS was capable of supporting or what the platform put in place by the organization was supporting. Deriving consistent matrix content in this area was difficult.

- SQL was referenced in three different ways in the survey: as a programming language, relative to the DBMS, and in context as a standard. SQL questions need to be reworked and regrouped in a single focus area of the survey.

- Additional questions need to be added to the survey which more clearly focus on the following areas:

  - data standardization and documentation
  - current methods to handle data access and exchange
  - application issues (modularity, complexity...)
  - age and stability of system

Surveyors

- There were four different surveyors/survey teams for the seven database platforms in this initial study. Interpretation of questions was not consistent across the teams.

- Prior to any future assessments, all interviewers need to jointly review and reach a common understanding/interpretation of all survey questions. Future surveyors should have a common "script" to accompany the survey.

- Consideration should be given to adding a functional component and proponent to the survey

Matrices

- Development of matrices led to the conclusion that some questions were irrelevant and they were dropped. On the other hand, some information which seemed to fit the matrix category was not requested in the survey.

- The TRM conformance matrix was the most complex to develop. An effort was made to conform to the model developed for the RCAS evaluation, but difficulties quickly surfaced. Some of the areas covered in the RCAS evaluation were not specifically covered in this database assessment. However, an Environment block was added for each of the platforms evaluated to cover TRM areas not attributable to the database, but about which sufficient information had been gathered to extrapolate a TRM compliance indication.

  Furthermore, the issue of how to credit compliance was not clear cut. In many cases, the technical platform of the system had the capability to support some aspect of the Technical Reference Model, but the system did not implement that feature. Since the platform was being evaluated for reuse, liberal weight was given to ability to provide support, even though it was not currently implemented.

Process

- In the attempt to achieve a speedy turnaround on the survey, insufficient groundwork was laid with the POCs who actually responded to the surveys. There was confusion as to the intent of the database survey, particularly where surveys were conducted in parallel with the ongoing Finance team surveys.

- All respondents were forwarded a copy of text and matrices for their system to review for accuracy. Although this was time consuming, this step was considered critical.